57

DOUBLE STUB TUNER MANUAL

DS-109 Series

WEINSCHEL ENGINEERING

GAITHERSBURG, MARYLAND

WEINSCHEL

FEATURES

ACCURATE RAPID RESETTING—Once a tuning setting has been determined, it can be repeated by adjusting the coarse and fine settings to their previously determined positions. Settings made in this manner repeat within a range of .005".

COLLET TYPE LOCKS—Each stub is equipped with a collet type lock on the coarse adjustment to prevent accidental movement.

ADJUSTABLE DISTANCE BETWEEN STUBS—Each tuner has four possible stub locations, enabling the stubs to be set at the most favorable of six available spacings to permit rapid convergence during the matching process.

ADJUSTABLE HEIGHT—The tuner is mounted on a pedestal and the vertical spacing between the pedestal and the center line is adjustable. The tuner can easily be set up in line with practically any commercially available slotted line and still have its weight completely supported without mechanical load on the connectors.

STAINLESS STEEL CLOSE TOLERANCE CONNECTORS—This tuner is equipped with precision type N connectors. To protect their close tolerance, and to provide long useful life, the connectors are made of stainless steel.

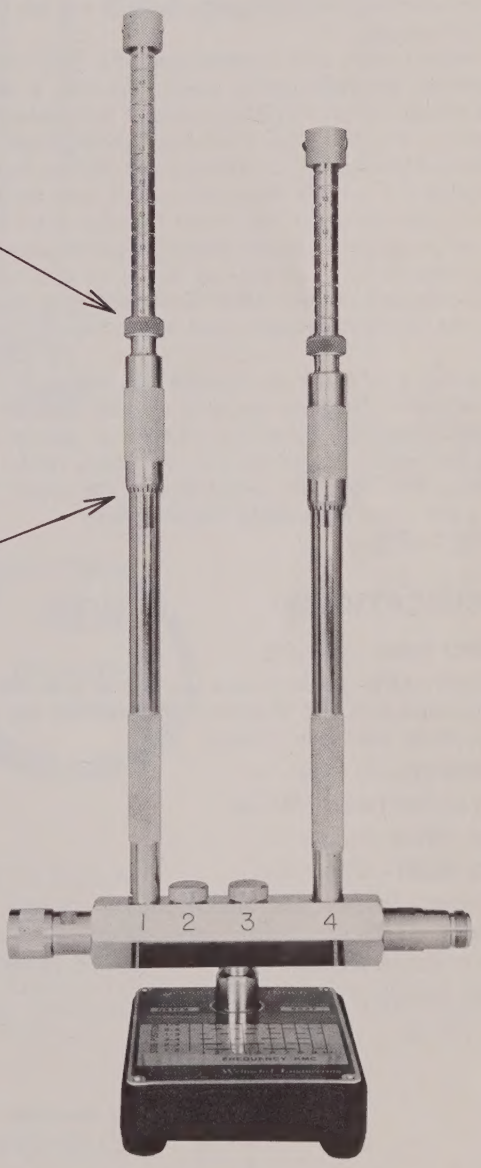
FINE TUNING—The micrometer adjustment provides an excellent fine tuning control, permitting easy location of the optimum balance setting.

APPLICATIONS

Double stub tuners are standard microwave accessories used both in the laboratory and on the production line. The most common application is to "match" or transform a load impedance. They are also used extensively to optimize the transfer from a generator to a load.

A more specialized application is the matching of a transition from a slotted line to a cable. This is a common problem when measuring the VSWR of cable connectors. Here the reset feature is indispensable if such measurements are to be made over a band of frequencies. Using the DS-109M, the transition is first matched at each test frequency and the stub settings recorded. The connector is then inserted and the tuner settings restored at each test frequency to make the connector VSWR measurement.

There are many other specialized applications for stub tuners. In all applications, the resettable feature and the vernier control on the Model DS-109M increases the usefulness of the tuner as well as the efficiency of the operator.



DS-109M, resettable double stub tuner

RESETTABLE DOUBLE STUB TUNER

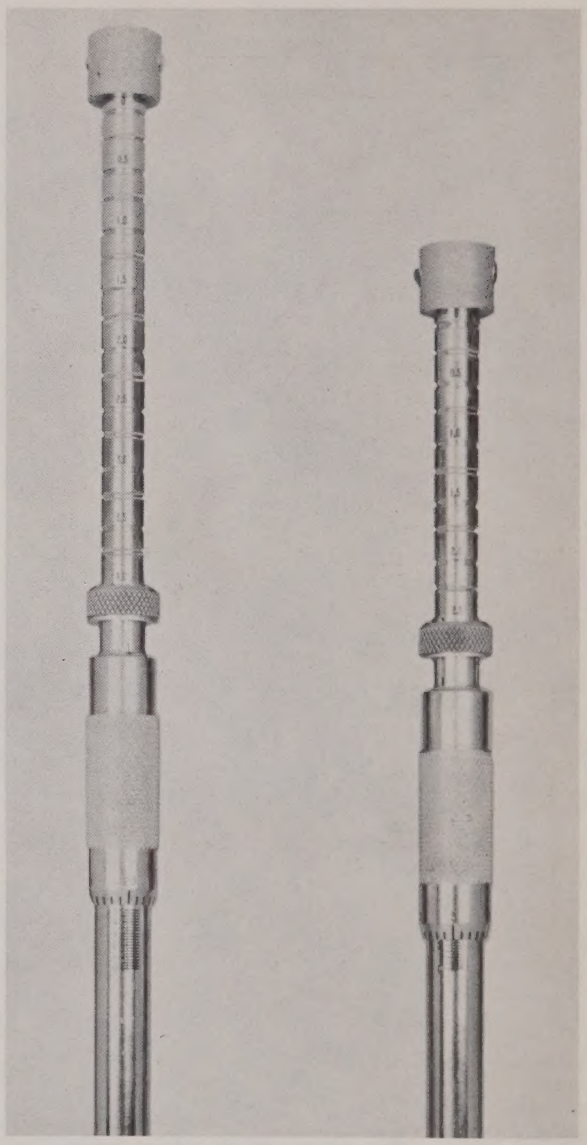
DS 109M .75-10 GC

DESCRIPTION

The Ψ Model DS-109M Double Stub Tuner is made with two resettable adjustments on each stub. Circumferential grooves at 0.25″ intervals along each stub provide a fast and accurate coarse setting. This adjustment can then be locked using a sliding collet. A micrometer type control with a 0.5″ range calibrated in 0.001″ increments is used for fine tuning. With dual adjustment the mechanical setting can be repeated quickly and easily with a precision of ±0.0025″. The micrometer control serves another extremely useful purpose since it makes it easy to move the stub smoothly and in very small increments to permit true fine tuning of the balance point.

To match a wide range of impedances, the Ψ DS-109M is provided with adjustable spacing between the stubs. A spacing can be selected for each frequency to obtain a rapid convergence to a match. The tuner is provided with a permanently mounted instruction plate indicating the preferred stub position for rapid convergence in a particular frequency range. In those rare cases where the load impedance falls outside the range of the tuner, it can be brought into range by inserting a quarter-wavelength line between the tuner and the load. Due to the wide spacing available, the tuner is useful below 750 Mc with some deterioration in the rapidity of convergence and the resulting convenience in use.

Ψ double stub tuners are provided with stands having a height adjustment to permit convenient use with practically any commercially available slotted line. This feature permits supporting the weight of the tuner on the stand, rather than attempting to support this weight through connectors, thus avoiding one source of instability in measurements.



Close-up view of DS-109M stub showing fine tuning micrometer.

SPECIFICATIONS

FREQUENCY RANGE—.75—10Gc.

IMPEDANCE MATCH—Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0 can be matched to 50 ohms.

LINE IMPEDANCE—50 ohms.

LENGTH OF STUB TRAVEL—20.5 cm.

OVERALL LENGTH—6⅛″.

OVERALL HEIGHT—12½ to 20¾″.

CONNECTORS—Stainless steel, precision type N, one male, one female.

HEIGHT OF CONNECTOR FROM BASE—Adjustable from 2⅜ to 3¼″.

SHIPPING WEIGHT—7 lbs.

PRICE—$250.00

Terms are net 30 days, subject to approval of credit. All prices are F.O.B. Gaithersburg, Maryland, and include commercial packing for domestic shipment within the continental United States. Prices and specifications are subject to change without notice.

Our Applications Engineering Department welcomes inquiries for coaxial components to meet special requirements.

DESIGNERS AND MANUFACTURERS OF PRECISION MICROWAVE EQUIPMENT

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DOUBLE STUB TUNERS MODELS DS-109, 109H, 109L AND 109LL* 40 MC - 10 GC

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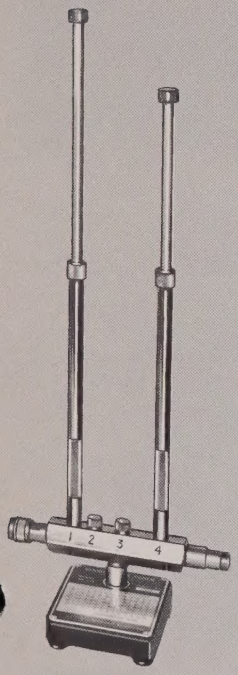
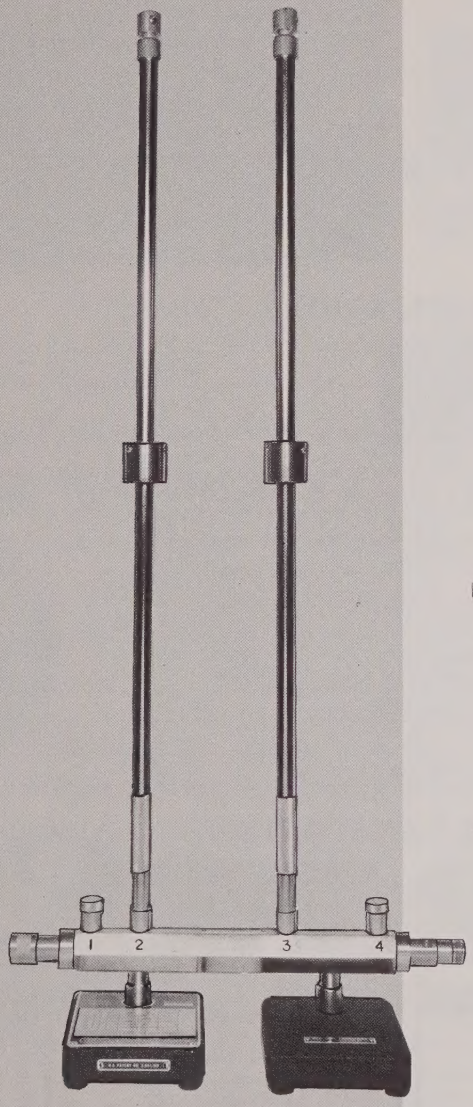
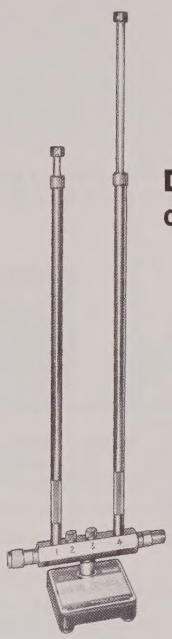


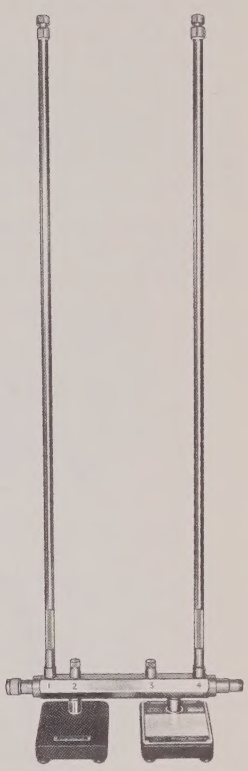
DS-109
0.75 - 10 GC



NEW
DS-109H
40 - 400 MC



DS-109L
0.4 - 4 GC



DS-109LL
0.2 - 2 GC

FEATURES

COLLET TYPE LOCKS—Each tuner is equipped with collet type locks to prevent accidental movement of the stubs after adjustments are made.

ADJUSTABLE DISTANCE BETWEEN STUBS—Each tuner has four possible stub locations, enabling the stubs to be set at the most favorable of six available spacings to permit rapid convergence during the matching process.

ADJUSTABLE HEIGHT OF CONNECTORS—The tuners are mounted on pedestals and the vertical spacing between the pedestal and the center line of the connectors is adjustable. The tuners can easily be set-up in line with practically all commercially available slotted lines and still have their weight completely supported without mechanical load on the connectors.

STAINLESS STEEL CLOSE TOLERANCE CONNECTORS—These tuners are equipped with precision type "N" connectors. To protect their close tolerances, the connectors are made of long wearing stainless steel.

*U.S. Patent Number 2,941,169

APPLICATIONS

These tuners are variable radio frequency impedance transformers which can be used to match a wide range of impedances. The most common use is to transform a load impedance to the impedance of a transmission line feeding the load so as to maintain a low standing wave ratio on the line.

DESCRIPTION

To match a wide range of impedances, Weinschel tuners are provided with adjustable spacing between the stubs. A spacing can be selected for each frequency to obtain a rapid convergence to a match. Each tuner is provided with a permanently mounted instruction plate indicating the preferred stub position for rapid convergence in a particular frequency range. In those rare cases where the load impedance falls outside the

range of the tuner, it can be brought into range by inserting a quarter wavelength line between the tuner and the load. Due to the wide spacing available, these tuners are useful below their low frequency limits with some deterioration in the rapidity of convergence and the resulting convenience in use.

Another factor of importance is the ease with which adjustments can be made. The stubs are designed so that the sliding contacts are removed from the high current point of the short, thus greatly reducing the noise produced when the short is in motion. Collet type locks are provided to prevent accidental movement of the stubs after they have been adjusted.

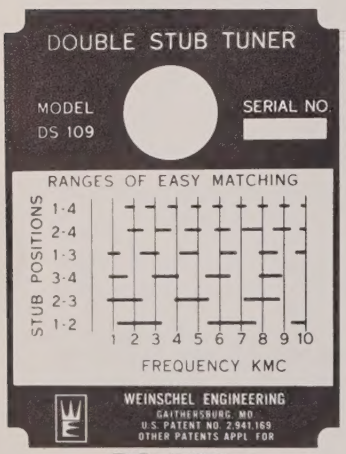
Weinschel double stub tuners are provided with stands having a height adjustment to permit convenient use with practically all commercially available slotted lines.

The Model DS-109H, the latest addition to the series, differs from the other models in that it utilizes a helical inner conductor in both the stubs and the body between the stubs giving the unit an electrical length much greater than its mechanical length. A 53 centimeter travel of the stubs corresponds to a change of more than 380 centimeters in their electrical length.

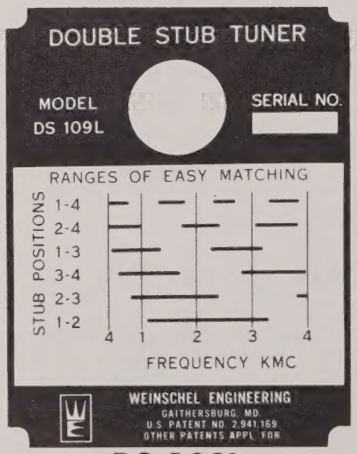
SPECIFICATIONS

Model Number	DS-109	DS-109L	DS-109LL	DS-109H
Frequency Range	0.75 - 10 GC	0.4 - 4 GC	0.2 - 2 GC	40 - 400 MC
Impedance Match (to 50 ohm line within specified frequency range)	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0	Any impedance less than 50 ohms and any impedance more than 50 ohms resulting in VSWR less than 7.0
Line Impedance	50 ohms	50 ohms	50 ohms	60 ohms
Length of Stub Travel	20.5 cm.	38 cm.	76 cm.	53 cm.
Overall Length	6⅛ in.	6⅛ in.	12 in.	12 in.
Overall Height	12½ to 20¾ in.	20½ to 35¾ in.	36¼ to 66½ in.	25⅛ to 48¾ in.
Connectors	Stainless steel type "N" one male and one female	Stainless steel type "N" one male and one female	Stainless steel type "N" one male and one female	Stainless steel type "N" one male and one female
Height of Connector from Base	2⅜ to 3¼ in.	2⅜ to 3¼ in.	2⅜ to 3¼ in.	2⅛ to 3¼ in.
Shipping Weight	5 lbs.	6 lbs.	12 lbs.	12 lbs.
Price	$150.00	$165.00	$190.00	$250.00

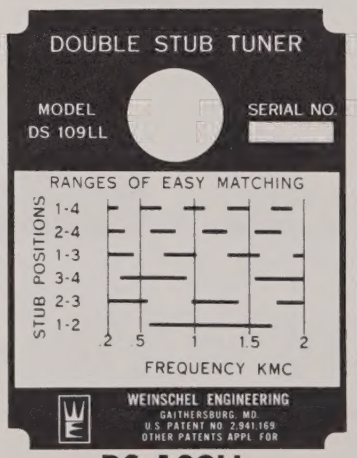
SAMPLE NAMEPLATES



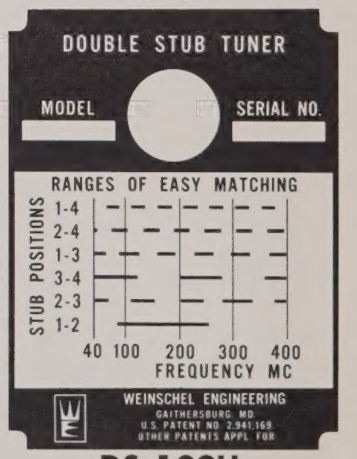
DS-109



DS-109L



DS-109LL



DS-109H

Our Applications Engineering Department welcomes inquiries for coaxial components to meet special requirements.

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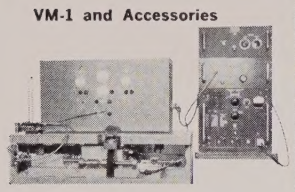
VM-1 and Accessories



PARALLEL I.F. SUBSTITUTION

Laboratory standard for measurement of insertion loss or incremental attenuation

Range: 106 db in one step, 120 db with partial rf substitution

Typical Systems Precision: .02 db for a 70 db measurement

Dynamic Power Range: −15 dbm to −121 dbm

Frequency Range: 50 mc to 18 gc with ψ auxiliary equipment

AUDIO SUBSTITUTION

SINGLE CHANNEL

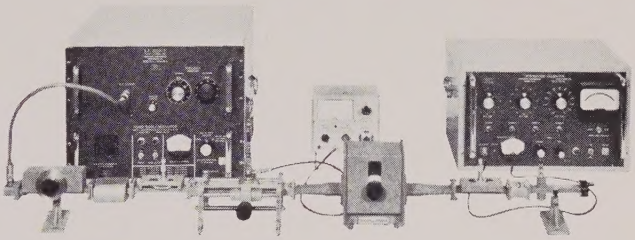
Measures attenuation directly up to 35 db

Typical Systems Error: 0.1 db/10 db

Resolution: About 0.02 db

Frequency Range: Determined by microwave circuit

Request Weinschel Engineering Application Note #1 for detailed information



DUAL CHANNEL

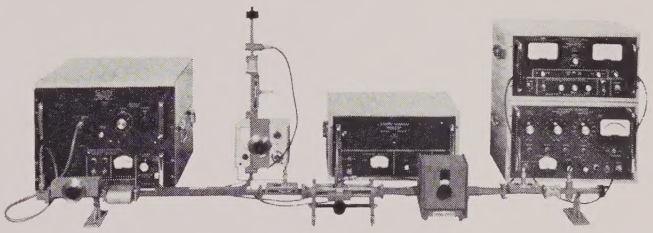
Measures attenuation directly up to 35 db

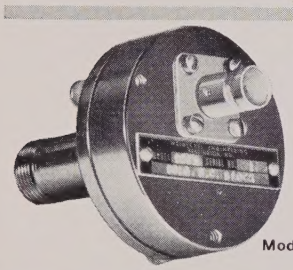
Typical Systems Accuracy: 0.02 db/10 db

Resolution: About 0.001 db

Frequency Range: Determined by microwave components

Request Weinschel Engineering Application Note #4 for detailed information





Model 926N

BARRETTER MOUNT WITH NOISE SUPPRESSOR

Frequency Range: Broadband 10 mc to 12.4 gc

Input VSWR: 1.45 maximum to 11.5 gc
1.75 maximum to 12.4 gc

Noise Suppressor: Integral with mount

NOISE SUPPRESSORS, 10 MC — 12.4 GC

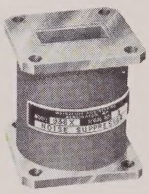
Model 936N for 50 ohm coax system 10 mc to 12.4 gc

Model 936X for X-band waveguide 8.2 to 12.4 gc

Isolate measurement circuits from audio and dc ground currents

Additional models in development

Model 936N



Model 936X

Model PB-1B

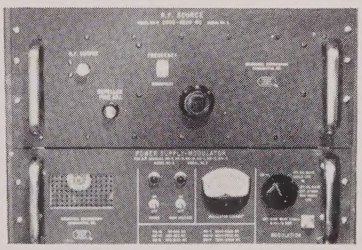
PRECISION DC BRIDGE

Accuracy: 0.1% of dc substituted power

Stability: DC bias constant to 0.001% with normal ac supply

Utility: For either grounded or ungrounded mounts, 3 to 15 ma bias

Also available: ψ Models TB-2A and TB-3 Power Bridges



POWER SUPPLY AND PLUG-IN RF SIGNAL SOURCES

Single knob control

High amplitude and frequency stability

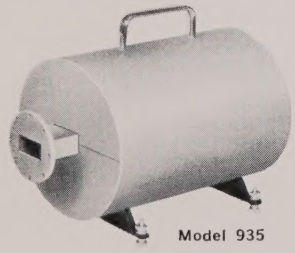
Low residual fm

Output: From 20 mw to 100 mw minimum, depending on frequency range

6 models cover frequency range from 50 mc to 10.5 gc

Other ψ signal sources and matching power supplies available to cover frequency range up to 18.0 gc.

Model No.	Frequency MCS	Minimum Power Output CW or Peak Power 100% Square Wave Modulated (for 50 ohm load)
MS-12	50-250	40 MW
MS-13	250-920	100 MW
MS-8	900-2200	20 MW
MS-9	2100-4200	2100-2600 MCS: 30 MW 2600-4200 MCS: 50 MW
MS-10	4000-7300	50 MW
MS-11	7200-10,500	7200-7400 MCS: 20 MW 7400-9700 MCS: 50 MW 9700-10,500 MCS: 20 MW



Model 935

THERMISTOR MOUNTS

Broadband: 10 mc to 10 gc in coax

Made for all waveguide sizes, 2.6 to 18.0 gc

Calibration factors supplied: Accurate to 1 or 2%, depending on frequency range

These mounts are thermally isolated and mounted in thermal lag chambers to eliminate measurement errors due to rapid fluctuations of ambient temperatures.

Weinschel manufactures many other instruments and systems not illustrated or discussed above. Please call on our Applications Engineering Department for assistance in solving your microwave measurement problems.

DESIGNERS AND MANUFACTURERS OF PRECISION MICROWAVE EQUIPMENT

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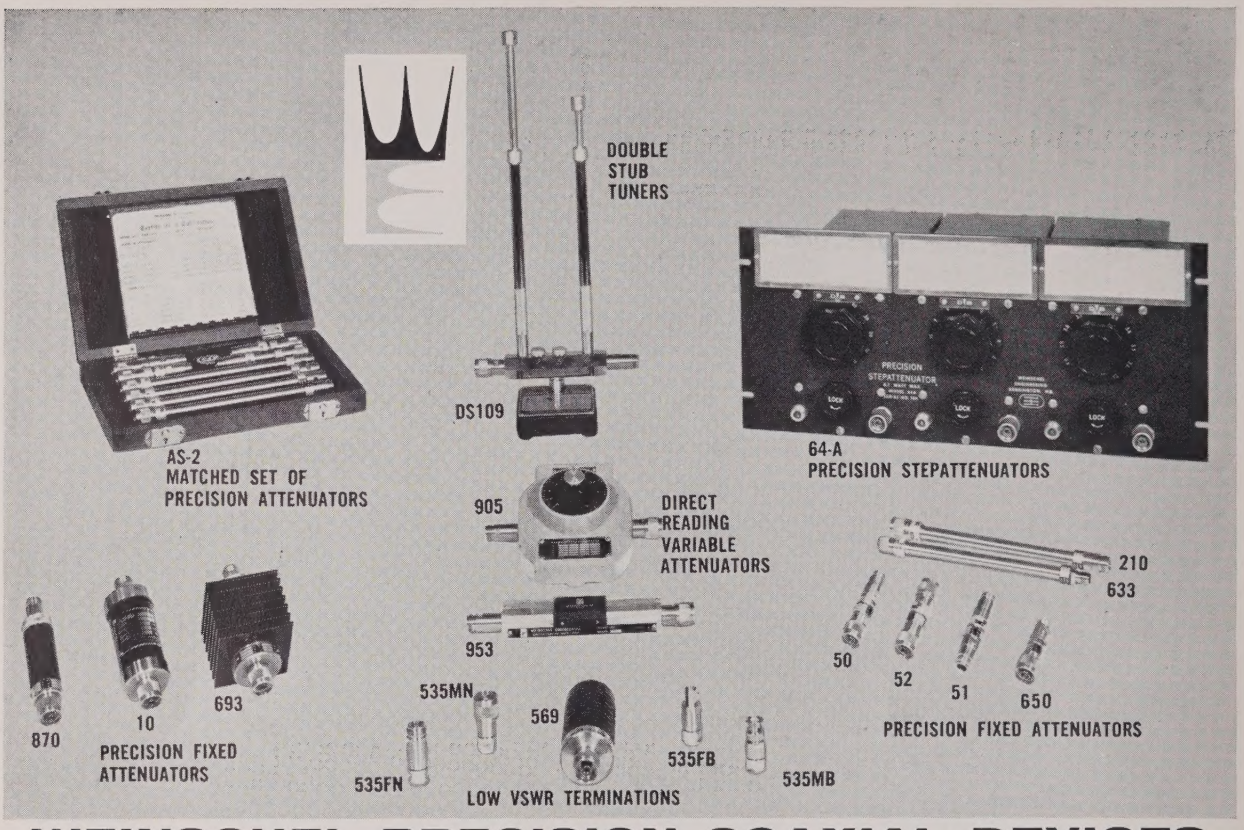

WEINSCHEL PRECISION COAXIAL DEVICES

A. PRECISION FIXED ATTENUATORS

Certificate of Calibration supplied with each model

Specifications	Model					
	210	50	650	10	693	870
Attenuation Range (db)	1-20	1-50	3-20	1-20	1-20	1-6
Frequency Range (gc)	1-12.4	DC-3	DC-5	DC-1.5	DC-1.5	7-12.4
Maximum Power Input: Average (Watts)	1-5	1	0.5-1	10-35	20-70	20
Maximum Input VSWR	1.30	1.20	1.20	1.30	1.30	1.35

B. PRECISION STEPATTENUATORS

Partial Specifications	Frequency Range: DC to 2 gc Maximum Power Input: 1 Watt Average; 1 KW Peak Maximum VSWR: 1.25
Attenuation Ranges	**Model 60A** 0 - 60 db in 1 db steps **Model 61A** 0 - 10 db in 1 db steps **Model 62A** 0 - 50 db in 10 db steps **Model 63A** 0 - 4 db 1 step from 0 to 3 db, 10 steps of 0.1 db from 3 to 4 db **Model 64A** 0 - 64 db (pictured) 0 - 3 db in 1 db steps 3 - 64 db in 0.1 db steps **Model 71** 0 - 120 db in 10 db steps
Calibration Data Supplied	Insertion loss data at dc, 1 and 2 gc for each step at an accuracy of .02 db up to 10 db and .02 db/10 db above 10 db.

C. MATCHED SET OF PRECISION ATTENUATORS

Designed for use as laboratory standards and for accurate extension of the range of power meters, the ℄ AS-2 set contains four ℄ Model 50 and four ℄ Model 530 attenuators. A complete calibration certificate with stated accuracy is supplied in a laminated plate permanently attached to the inside cover of the walnut box containing the attenuator set.

Specifications	Model 50	Model 530
DB Values	3, 6, 10, 20	3, 6, 10, 20
Calibration Frequencies	DC; 1, 2, 3 gc	3, 4, 5, 6, 7, 8, 9, 10 gc

D. PRECISION DIRECT READING VARIABLE ATTENUATORS

(Models 905 and 953 pictured)

Shown are two of the new ℄ line of continuously variable attenuators. DIRECT READING AT A REFERENCE FREQUENCY. Corrections for other frequencies are supplied on a permanently attached plate.

Partial Specifications:	Model 905	Model 953
Frequency Range	DC to 1 gc	2.5 to 10 gc
Variable Range	10 db	10 db
Minimum Insertion Loss	½ db	1 db
Direct Reading in db at	500 mc	4 gc
Calibrated additionally at	DC; 300, 750, 1000 mc	2.5 to 10 gc

Other continuously variable attenuators are also available.

E. LOW VSWR TERMINATIONS, DC - 10 gc

High Reliability

Partial Specifications	Model 535
Calibration Data Supplied	DC resistance, VSWR at 0.4, 1, 2, 4, 7.5 and 10 gc
Maximum Power Input	1 Watt Average; 1 KW Peak
Impedance	50 ohms
VSWR Maximum	1.03 to 1 gc, 1.05 to 4 gc, and 1.15 to 10 gc

Also available from Weinschel are coaxial terminations rated at up to 10 Watts average.

F. DOUBLE STUB TUNERS, 50 mc to 10 gc

Chart on base for easy matching
Collet-type locks prevent accidental movement of stubs
Adjustable spacing between stubs
Adjustable height of connectors

Model	Frequency Range
DS-109	0.75 to 10 gc
DS-109L	0.4 to 4 gc
DS-109LL	0.2 to 2 gc
DS-109H	50 mc to 1 gc

Weinschel manufactures a wide variety of coaxial devices, some of which are shown above. Consult our Applications Engineering Department or our representative in your area for assistance in the selection of suitable coaxial devices or for units designed to your requirements. For general utility applications we recommend our BlueLine series of attenuators and terminations.

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